

Request for Economic Stimulus Funds

Concept Proposal

Submitters (Energy and Sustainability: Doug Whitlock and Jim Tracy):

EKU CRAFT (Center for Renewable and Alternative Fuel Technology)

Chair of EKU CRAFT Proposal Team: Dr. Bruce Pratt – (bruce.pratt@eku.edu)

Project Title: EKU-CRAFT Cellulosic/Algae Biofuels Pilot Plant for Demonstration of Scale-Up Technologies and Continued Applied and Basic Research in Biomass to Biofuel Conversion

Project Partners (Known or Anticipated):

External to EKU:

- ❖ General Atomics (Corporate Partner on existing proposals)
- ❖ City of Winchester (Ed Burtner – Mayor; Todd Denham - Economic Development)
- ❖ Clark County, KY (Henry Branham – Judge Executive)
- ❖ Kentucky State University (Tamara Sluss – Biomass; Ken Bates - Center for GIS and Geospatial Analysis)
- ❖ Morehead State University (Dr. Mike Phillips, Chair, Department of Agriculture)
- ❖ Centre College – (Dr. Preston Miles - Department of Chemistry)
- ❖ Governor's Office of Ag Policy (Ag Development Funds – Proposal pending)
- ❖ Appalachian Regional Commission (ARC; Proposal Pending)

EKU:

- ❖ Departments of: Agriculture, Chemistry, Economics and Biology.
- ❖ Other Units: EK-ERI (*Eastern Kentucky* Environmental Research Institute), CEDET (Center for Economic Development, Entrepreneurship & Technology) and Regional Stewardship

Project Background & Purpose (Justification for Project): In cooperation with General Atomics, EKU has an ongoing study of the feasibility of a biofuel industry based on cellulosic feedstocks in Kentucky. This project is funded with Federal and State grants. The objective of this work is to provide a picture of both the challenge of developing and the potential benefits of



a commercially viable biofuel industry in the Commonwealth. In particular, the project will provide an evaluation of available technologies for conversion of cellulose to sugar and provide a conceptual design for a bio-oil processing plant based on cellulosic feedstocks. The project will also provide baseline agricultural and economic data regarding a bio-oil industry. This will include information on potential crops, yields, land use, and transportation systems, in addition to the economic significance of the industry to the economy of the Commonwealth. When completed, in about a year, the ongoing study will provide a solid understanding of the technological and economic aspects of the development of a commercially viable bio-oil industry in the Commonwealth. The cellulose to algae bio-oil process would provide the material for conversion to biodiesel and bio-JP8 jet fuel. The next logical step in commercialization will be the construction of a cellulosic/algae pilot plant. This is a necessary step in taking the technology from the laboratory and applying it in a large-scale production facility

The cellulosic/algae pilot plant would demonstrate the project viability and buy-down the risk to entice Venture Capital investors for a commercial scale facility. The City of Winchester, KY has allocated a parcel of land in their industrial park to be used for the pilot plant. Preliminary cost modeling estimates are that a 50 million gallon facility would be needed to prove the economic feasibility. It has been estimated that construction of a 50 million gallon per year commercial facility would provide 4500 jobs and provide an economic impact of over \$480,000,000 in direct, indirect and induced value. The commercial facility would be acquiring biomass from a radius of 30 to 50 miles surrounding Winchester. The economic implications to the local economy and the agricultural community are enormous. Once this technology has been proven it can be replicated in other areas of the Commonwealth (or nation) to take advantages of local biomass. Such areas would be reclaimed strip mines in Eastern Kentucky and the Appalachian Region and crop residues in the western part of the Commonwealth and other areas of the nation's breadbasket.

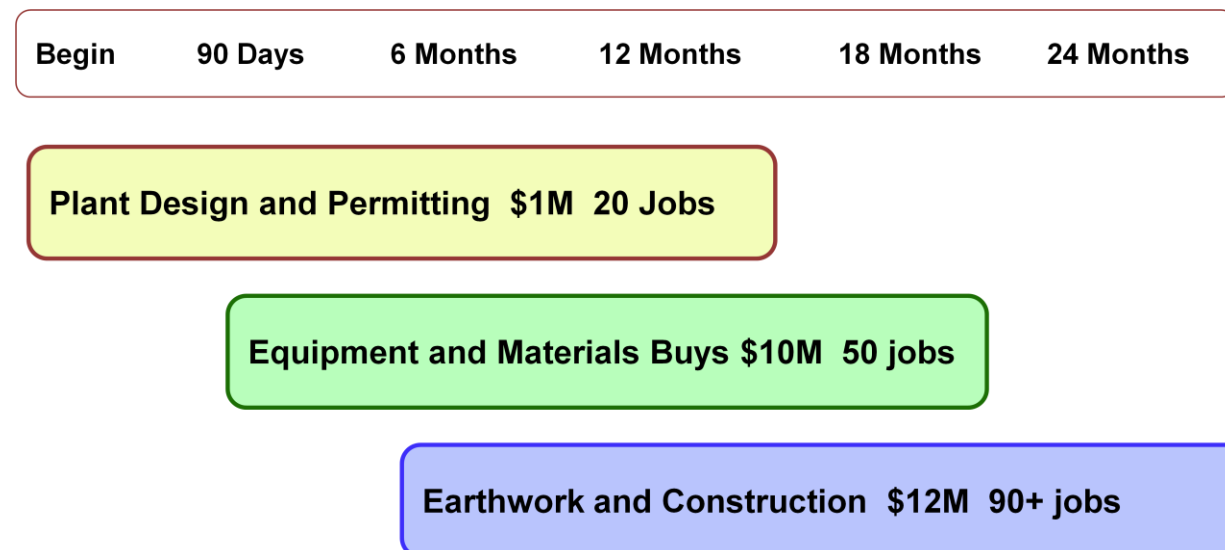
Project Description (General Goals & Implementation Strategies): This stimulus request will provide the funding for the construction of a 1-2 M gal/year cellulosic/algae biofuels pilot plant and continued inquiry based research and development. The pilot plant needs to be at a scale sufficient for generation of data applicable for full scale plant design. The pilot plant would provide systems evaluation, process design and testing necessary for the advancement of the biofuels program to a commercial production facility. Once a commercial production facility is operational the pilot plant would continue as an engineering baseline and research platform to provide continuing research that will provide valuable information for commercial improvement and enhancements.

While the pilot plant is under construction and throughout the production phase continued applied and basic research will be necessary to optimize the processes. Continued research will be necessary in the areas of biomass production and transportation, saccharification and analysis of the biomass, algae growth and oil recovery. In addition, research will be necessary in the area



of co-product utilization. Exploitation of residual products from biomass saccharification and algae residue will provide additional value to the process.

Estimated time frame for the 1-2 M gal/year biomass to bio-oil pilot plant is illustrated below.



Project Team (Project Manager(s), Content Experts, Instructional Designers, etc.):

Drs. Bruce R. Pratt, Project Manager & Don Llewellyn (Dept. Agriculture), Frank O'Connor (Dept. Economics), Nathan Tice & Laurel Morton (Dept. Chemistry), Jim Elliott, Kevin Downey & George Campbell (General Atomics), Ed Burtner, Todd Denham and Henry Branham (City of Winchester and Clark Co., KY)

Project Budget & Amount of Economic Stimulus Funds Requested:

Pilot Plant Construction			
Final Plant Design & Permitting	\$1,000,000		
Site Preparation	\$2,000,000		
Materials & Equipment	\$10,000,000		
Construction	\$10,000,000		
			\$23,000,000
Applied and Basic Inquiry Based Research			
Biomass Establishment and transportation	\$1,000,000		
Saccharification and Analytical	\$1,000,000		
Algae and Oil Extraction Research	\$1,000,000		
Co-product Utilization	\$1,000,000		
			<u>\$4,000,000</u>
			\$27,000,000

